



Australian Bureau of Statistics

1350.0 - Australian Economic Indicators, Dec 2004

ARCHIVED ISSUE Released at 11:30 AM (CANBERRA TIME) 30/11/2004

Feature Article - Seasonally Adjusted and Trend Estimates for the Consumer Price Index (CPI)

INTRODUCTION

A study conducted in 1991 concluded that, while some component price series of the CPI may be seasonal, such seasonal elements broadly cancelled each other out in the All groups CPI, which was found to not exhibit any stable seasonality. This report provides the results of a recent investigation to re-examine the issue of seasonality in the CPI.

TIME SERIES DECOMPOSITION

Three distinctly different notional influences could underlie any observation in a time series such as the CPI:

- trend movements - measures of the underlying behaviour of the series
- seasonal influences - systematic calendar related effects, such as fruit prices dropping as the various fruits become available in large volumes as they come into season
- residual irregulars - unpredictable short-term fluctuations in a series, not systematic or calendar related, involving one-off events such as changes in petrol prices due to world events or \$AUD/\$US exchange rate changes. Irregulars could also be caused by sampling or measurement errors in the estimates.

When a series is seasonally adjusted, estimates of the seasonal influences (i.e. systematic calendar related effects) are removed from the original data. In other words, the seasonally adjusted estimates reflect the underlying trend and all the irregular effects.

Most series that exhibit seasonal patterns do so because of some direct calendar effect or for some underlying institutional reason tied in with the regular timing of particular types of payments. For example, retail sales grow very strongly in December each year because of Christmas, and income tax payments by individuals rise strongly in June quarter each year because it is the end of the financial year. The pattern underlying the institutional effects can change as a result of the associated arrangements being changed. For example, a number of years ago, individual tax payers who were not wage and salary earners paid their tax in a lump sum around March each year. This system was changed to one in which tax payments were made each quarter, significantly changing the seasonal pattern by smoothing out the large spike that occurred once each year.

IDENTIFYING SEASONALITY

In identifying seasonality, there are two main factors that are considered:

- Does stable seasonality exist in the span of the data being published? This relates to any significant seasonal peaks and/or troughs that are evident in the data on a regular basis.

- Is the inherent volatility in the data too great to extract reliable estimates of any seasonal patterns? This deals with measuring the magnitude of any seasonal peaks and/or troughs in the data in a consistent way.

ASSESSING SEASONALITY

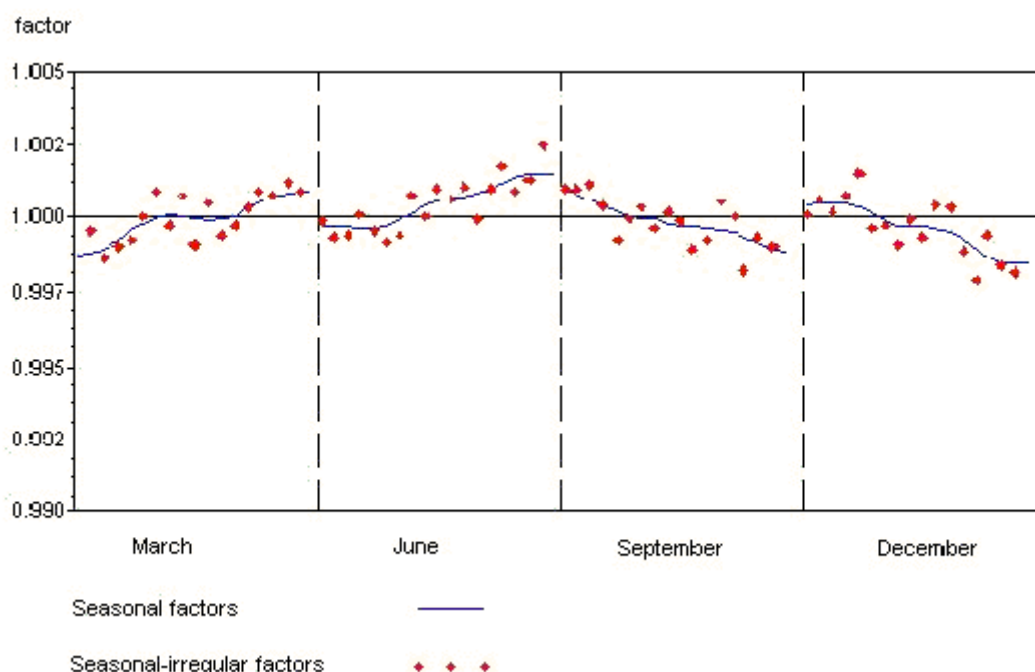
One analytical tool used by the ABS to assess the seasonality of individual time series is to plot the original data (with the trend estimate removed) against its estimated seasonal pattern. These charts plot each time period (e.g. month, quarter) in separate panels and display the properties of the seasonality in a time series.

The original data points with the trend estimate removed are represented by the scatter plot in each panel. Moving averages are then applied to these data to produce estimates of seasonal factors. The neutral line (y-axis = 1.000) represents the trend estimate and indicates seasonal neutrality. Values of the seasonal influences above (or below) the neutral line indicate seasonally high (or low) estimates and represent seasonal peaks (troughs) in the time series. When at least one panel displays significant and consistent evidence of seasonality, a time series is deemed to be seasonal.

SEASONALITY AND THE CPI

Graph 1 presents this type of chart for the All groups CPI for the weighted average of the eight capital cities. The span of data used is from March quarter 1987 to June quarter 2004. That is, March quarter data from 1987 to 2004 appear in the first panel, June quarter data from 1987 to 2004 appear in the second panel and so on.

GRAPH 1: ALL GROUPS CPI SEASONALITY, MARCH QUARTER 1987 TO JUNE QUARTER 2004

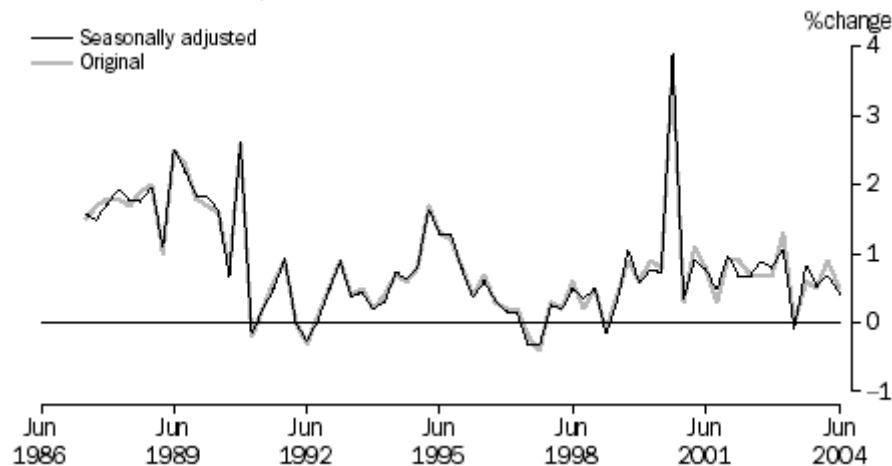


The scatter plot in each of the four panels shows that the seasonal/irregulars are scattered around the 1.000 factor on the y-axis (i.e. around the line indicating no seasonality exists). In this example, three observations can be made. First, the contribution of the seasonal influences and residual/irregular factors is very small, in the order of less than $\pm 0.2\%$ in most cases. Second,

the relatively high degree of volatility in the irregular component compared with the estimated seasonal factors results in a poor degree of reliability in the estimated seasonal factors. Third, although seasonality is weak there is some indication in recent years of a positive seasonal influence in the first two quarters, and the opposite for the last two quarters.

Further evidence of the lack of seasonality in the All groups CPI can be seen in graph 2, which shows movements in the original series and the seasonally adjusted series. A property of series identified as being not seasonal is that the quarter-to-quarter percentage changes in the original and seasonally adjusted estimates are more or less the same. In other words, the original series by itself provides a good estimate of the 'seasonally adjusted' series. Clearly, this is the case for the All groups CPI.

GRAPH 2: ALL GROUPS CPI, PERCENTAGE CHANGE FROM PREVIOUS QUARTER

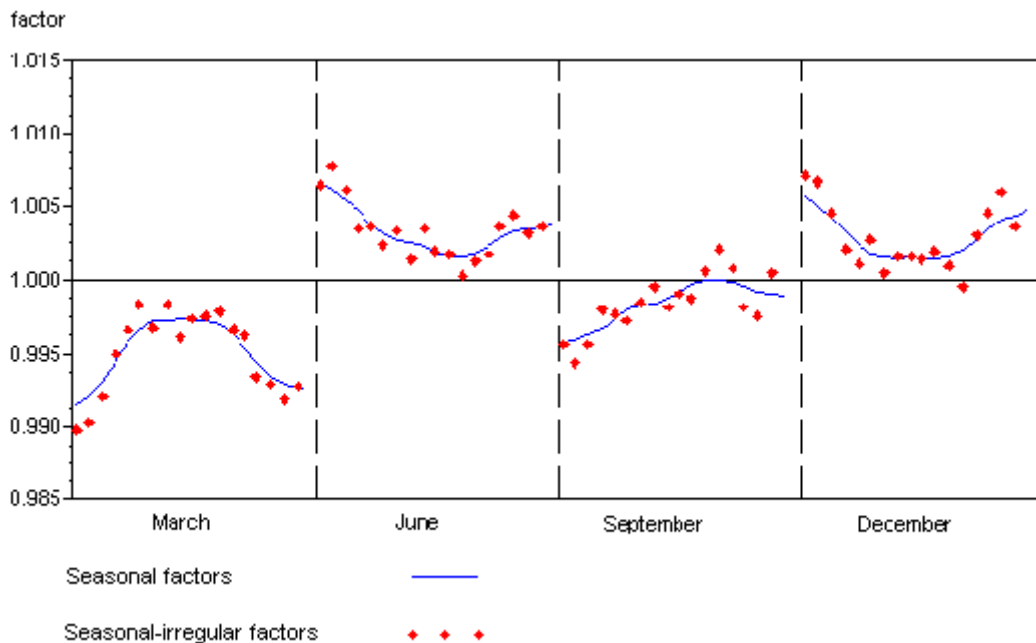


As well as examining the All groups CPI for seasonality, this latest study looked at each of the eleven component groups in the CPI. Six groups were identified in this analysis as being seasonal: clothing and footwear; housing; household furnishings, supplies and services; health; recreation; and education. A similar analysis of the seasonality of the eleven component groups is available on request.

It may be useful to compare the analysis of one of these 'seasonal' series, for example clothing and footwear, with that of the All groups CPI.

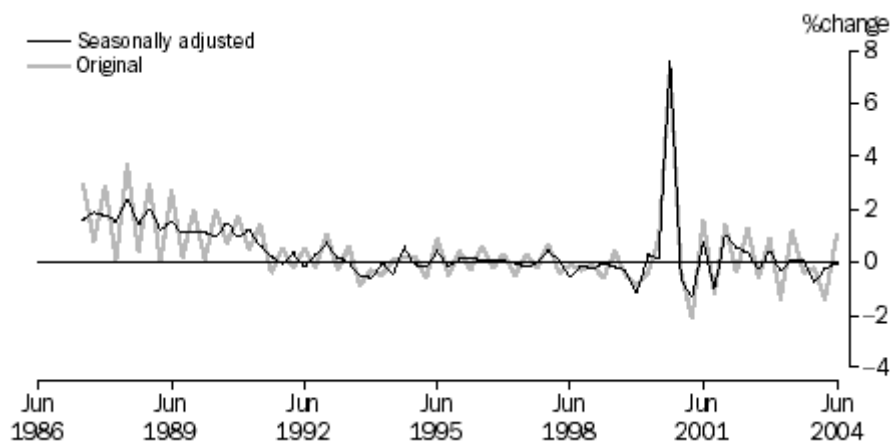
It can be seen from graph 3 (note the significantly different scale compared with that used in graph 1) that generally the March and September quarters are seasonally low periods for clothing and footwear prices (which are collected in the first month of each quarter), reflecting the usual pattern of Christmas/New Year and end of financial year stock-take sales, respectively. On the other hand, the June and December quarters are seasonally high periods, reflecting the return to normal prices after these sales and the general increase in prices associated with the release of new winter and summer season fashion clothing. The contribution of the seasonal influences is also more prevalent than in the All groups, being in the order of +/- 0.5%.

GRAPH 3: CLOTHING AND FOOTWEAR SEASONALITY, MARCH QUARTER 1987 TO JUNE QUARTER 2004



Finally, from graph 4, it can be seen that the estimated seasonally adjusted percentage changes are much smoother than the percentage changes in the original series due to the removal of the seasonal variations.

GRAPH 4: CLOTHING AND FOOTWEAR, PERCENTAGE CHANGE FROM PREVIOUS PERIOD

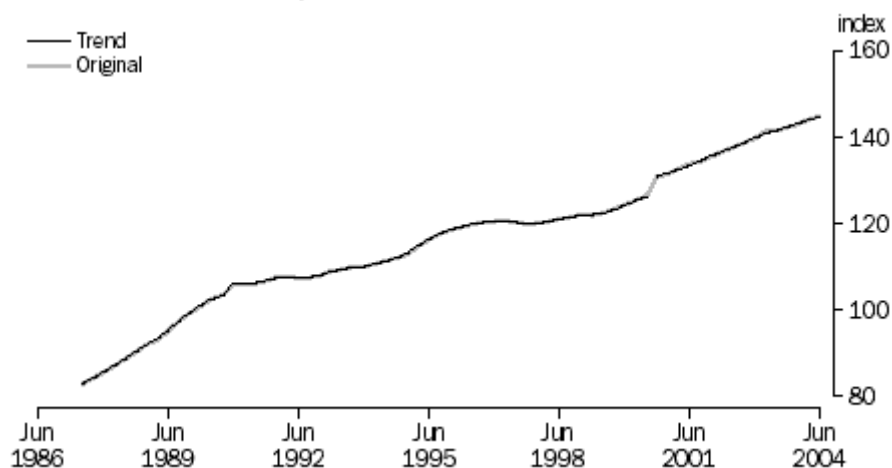


TREND ESTIMATES

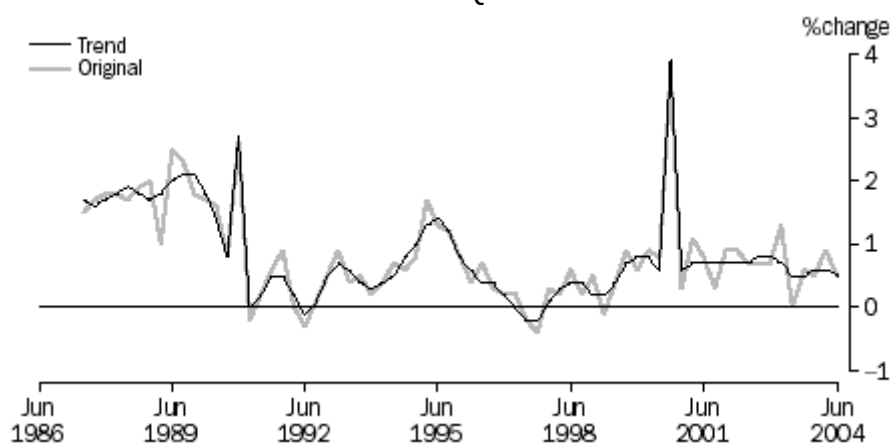
Trend estimates are obtained by removing an estimate of the irregular component from the seasonally adjusted series. Despite the fact that the CPI All groups is not seasonal, a trend series could be produced for the CPI by removing an estimate of the irregular component from the original series.

Graphs 5, 6 and 7 plot index numbers, percentage changes from the previous quarter and percentage changes from the corresponding quarter of the previous year for the original and trend estimates of the All groups CPI. The trend estimates have been derived using the 7-term Henderson weighted moving average technique. The irregulars/residual volatility is relatively very small against the trend estimates. It can be seen from these graphs that while there is some smoothing effect of the trend on the quarter-to-quarter percentage changes for the All groups CPI, there is little difference between the original series and trend estimates for index numbers and the “through the year” percentage change.

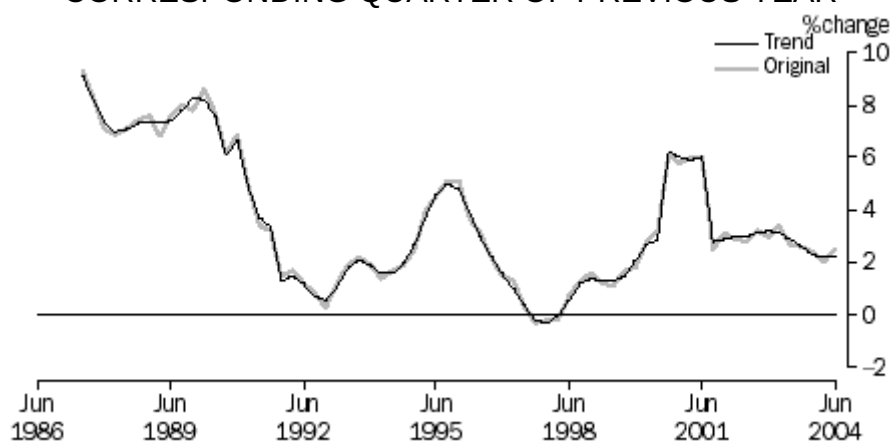
GRAPH 5: ALL GROUPS CPI, ORIGINAL AND TREND INDEX NUMBERS



GRAPH 6: ALL GROUPS CPI, ORIGINAL AND TREND, PERCENTAGE CHANGE FROM PREVIOUS QUARTER



GRAPH 7: ALL GROUPS CPI, ORIGINAL AND TREND, PERCENTAGE CHANGE FROM CORRESPONDING QUARTER OF PREVIOUS YEAR



A downside of trend estimates is that they can be revised for the last three quarters in the series as extra terms are added to the end of the series, even if none of the earlier original terms has been revised. One of the longstanding features of the CPI is that it is not revised in the normal course of events. Therefore the ABS is not in favour of producing trend estimates of the CPI because of the relatively small differences between them and the original series and their

potential for being revised.

CONCLUSION

As in a previous study, the All groups CPI has been found to not have any stable seasonal pattern. Any seasonal or irregular effects that do exist are very weak and the trend behaviour of the series generally determines most of the CPI movement. Some component price series of the CPI are seasonal but such seasonal elements tend to balance out in the All groups CPI. Given the lack of seasonality in the All groups CPI and in a number of the component series, the ABS sees little purpose in publishing seasonally adjusted estimates for those components that do exhibit seasonality.

The ABS does not propose to produce trend estimates of the CPI because they are generally not markedly different from the original series and because of their potential for being revised.

FURTHER INFORMATION

For more information about the Consumer Price Index contact Steve Whennan on (02) 6252 6251 or by email [**steve.whennan@abs.gov.au**](mailto:steve.whennan@abs.gov.au)

This page last updated 8 December 2006

© Commonwealth of Australia

All data and other material produced by the Australian Bureau of Statistics (ABS) constitutes Commonwealth copyright administered by the ABS. The ABS reserves the right to set out the terms and conditions for the use of such material. Unless otherwise noted, all material on this website – except the ABS logo, the Commonwealth Coat of Arms, and any material protected by a trade mark – is licensed under a Creative Commons Attribution 2.5 Australia licence